SUPPORT FOR THE AMENDMENTS

This Amendment adds new Claims 23-24. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claims 23-24 is found in Claim 7 and in the specification at least at page 45, lines 21-26. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 5-13 and 22-24 will be pending in this application. Claim 5 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention provides a recordable/erasable optical information recording medium that utilizes a difference in reflectivity resulting from a phase-change of an SbTe alloy recording layer upon irradiation with a laser. Because the SbTe alloy is amorphous as deposited, the recording layer must crystallized ("initialized") before use by initially heating the recording layer. After the recording layer is initialized, bits are recorded by changing the crystalline SbTe alloy into the amorphous phase. Bits are erased by changing the recorded amorphous bits back into the crystalline SbTe alloy phase. The present invention solves initialization and stability problems in $Sb_{70}Te_{30}$ alloy recording layers by adding Zn to facilitate initialization and adding Ge to improve archival stability. See, specification at page 42, lines 3-5, 16-17; page 42, line 24 - page 43, line 1.

Claims 5-13 and 22 are rejected under 35 U.S.C. § 103(a) over JP 01-303643 ("Fujimori") in view of U.S. Patent No. 5,709,978 ("Hirotsune") and U.S. Patent No. 5,818,808 ("Takada"), further in view of EP 0195532 ("Morimoto").

Any *prima facie* case of obviousness based on the cited prior art is rebutted by the significant improvement in initialization and stability achieved in accordance with the present invention using a recording layer having the composition $Zn_zGe_y(Sb_xTe_{1-x})_{1-y-z}$, where $0.65 \leq x \leq 0.85$; the range of Ge is set by $0.01 \leq y \leq 0.20$; and the range of Zn is set by $0.01 \leq z \leq 0.15$. Ge is particularly effective for improving the thermal stability of the amorphous state and for increasing the archival stability of recorded amorphous marks. When the amount of Ge exceeds 20 atomic%, the composition tends to undergo phase separation, and the composition is likely to change by repetitive overwriting. Specification at page 42, lines 3-11. Zn facilitates initialization of the amorphous recording layer. If Zn exceeds 15 atomic%, the stabilizing effect of Ge tends to be lost. Specification at page 42, lines 15-20.

The specification demonstrates the significant improvements in initialization and stability provided by Ge and Zn by means of comparative examples, as shown in the following table.

	Specification	Composition	Initial crystallization*[1]	Stability of recorded amorphous marks*[2]
Comp. Ex. 7	pp. 77-78	$Sb_{72}Te_{28}$	×	×
Ex. 14	p. 76	$Ge_{10}Sb_{67}Te_{23}$ (= $Ge_{10}(Sb_{74}Te_{26})_{90}$)	×	○
Addt'l Comp. Ex. 1	*3)	$(Sb_{0.7}Te_{0.3})_{0.9}Zn_{0.1}$ (=$Zn_{10}(Sb_{70}Te_{30})_{90}$)	○	×
Addt'l Comp. Ex. 1	*3)	$(Sb_{0.8}Te_{0.2})_{0.9}Zn_{0.1}$ (=$Zn_{10}(Sb_{80}Te_{20})_{90}$)	○	- *4
Ex. 9	p. 70	$Zn_6Ge_7Sb_{62}Te_{25}$ (= $Zn_6Ge_7(Sb_{71}Te_{29})_{87}$)	○	○

*1) ×: Initialization required multiple exposures with a DC laser beam.

○: Initial crystallization was carried out in one scanning operation.

*2) ×: After the disk was left for 500 hours (or for 100 hours as in Additional Comparative Example 1) in an environment in which temperature was 80 C and the relative humidity was 80%, the recorded signals were deteriorated and were impossible to read out.

○ : Even after the disk was left for 500 hours (or 2000 hours as in Example 14), the recorded signals showed no deterioration and could be read out sufficiently.

*3) For the details of the experiment, please refer to the Declaration Under 37 CFR 1.132 filed September 29, 2003.

*4) Even if the recording conditions were changed, it was impossible to form amorphous marks (for details, see the Declaration Under 37 CFR 1.132 filed September 29, 2003.

From the data, it is evident that:

(1) addition of Ge to the $Sb_{70}Te_{30}$ binary eutectic composition increases the archival stability of recorded amorphous marks;

(2) addition of Zn to the $Sb_{70}Te_{30}$ binary eutectic composition facilitates initialization (initial crystallization); and

(3) simultaneous addition of Ge and Zn to the $Sb_{70}Te_{30}$ binary eutectic composition not only facilitates initialization (initial crystallization) but also increases the archival stability of recorded amorphous.

Furthermore, the attached Declaration Under 37 C.F.R. § 1.132 demonstrates that initialization (initial crystallization) of a recording layer of $(Sb_{71}Te_{29})_{89}Ge_5\mathbf{Zn}_6$ is easier than initialization of a recording layer of of $(Sb_{71}Te_{29})_{89}Ge_5\mathbf{Si}_6$ or of $(Sb_{71}Te_{29})_{89}Ge_5\mathbf{Cu}_6$. The cited prior art fails to suggest the facilitation of initialization achieved by the present invention by adding Zn, instead of some other element, to a $Sb_{70}Te_{30}$ binary eutectic composition.

The Final Rejection asserts that the improvement in initialization achieved by the present invention through the addition of Zn as a third element to $Sb_{70}Te_{30}$ alloy is suggested by the prior art. In particular, the Final Rejection asserts:

> The addition of a third element to TeSb media is disclosed on page 14 of the translation [of Fujimori] as resulting in stabilization of the amorphous state due to a raising (sic) of the crystallization temperature and an increase in the crystallization speed. As the erasure and initialization are both amorphous to crystalline transitions, the increase in the speed of these translations by the addition of the third element facilitates them. Therefore the argued positions in the response merely point to benefits already ascribed to these materials. Final Rejection at page 5, lines 8-11.

The English-language translation of Fujimori discloses at page 14 with respect to the third element that:

> ...[O]ptical recording characteristics as set forth below can be improved further by adding a small amount of a third element other than Sb and Te to the Sb-Te alloy γ-phase.
> a) The crystalline temperature is further raised and the amorphous state is stabilized.
> b) The crystallizing speed by the irradiation of laser light is further increased and the high speed erasing property can be improved. English-language translation of Fujimori at page 14, lines 6-8.

Thus, Fujimori discloses adding a third element to improve stability and erasing speed.

Applicants respectfully traverse the Final Rejection's assertion that Fujimori's disclosure that the third element improves erasing speed is also a disclosure that the third element improves initialization. Initialization (initial crystallization) and erasing (recrystallization) are not the same phenomenon.

The initialization process involves crystallizing an amorphous, as deposited, material that extends throughout the entire recording layer.

In contrast, the erasing process involves recrystallizing amorphous bits that are surrounded by crystallized material. The crystallized material facilitates the erasing (recrystallization) process by serving as nucleation sites for crystallization of the amorphous bits.

Because the nucleation sites at the amorphous/crystalline boundary that facilitate the erasing process are not available during the initialization process, crystallization is much more difficult to achieve during the initialization process than during the erasing process. This increased difficulty is discussed in detail in the attached "Crystallization behavior of Ge-doped eutectic $Sb_{70}Te_{30}$ films in optical disks", Applied Optics, Vol. 41, No. 29, 10 October 2002, page 6220 *et seq.* (In particular, note Figs. 2 and 8 and the associated discussion. Regarding Fig. 8,

> This experiment clearly demonstrates the role of the amorphous-crystalline boundary in the crystallization kinetics of $Ge_5Sb_{68}Te_{27}$ material. Applied Optics at page 6224, column 2, lines 22-25).

According to the present invention, Zn is added to Ge-doped $Sb_{70}Te_{30}$ recording layer compositions in order to facilitate initialization (initial crystallization) from the as-deposited amorphous state, and not in order to facilitate erasing (recrystallization) of amorphous recorded bit.

The cited prior art fails to suggest the improved initialization and stability of recorded marks achieved by the present invention over the recited ranges of Ge and Zn. Thus, any

prima facie case of obviousness is rebutted. Therefore, the rejection under 35 U.S.C. § 103(a) should be withdrawn.

The Information Disclosure Statement filed herewith does not cite the U.S. Patent No. 4,670,345 reference cited in the European Search Report because U.S. Patent No. 4,670,345 corresponds to EP 0195532 ("Morimoto"), which is already of record.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Applicants respectfully request that the Examiner grant an interview with Applicants' representative prior to issuing an Office Action in response to this Amendment. Applicants' representative can be contacted at the telephone number listed below.

Respectfully submitted,

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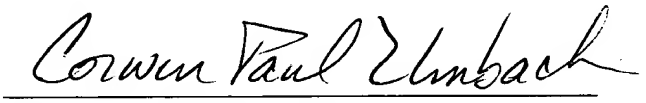
MAIER & NEUSTADT, P.C.
Norman F. Oblon



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Attachments:
Applied Optics, Vol. 41, No. 29, 10 October 2002, page 6220 *et seq.*
Declaration Under 37 C.F.R. § 1.132

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